**The Case of Mole Airlines Flight 1023**

You and your team of medical examiners are called to the scene of a plane crash. The plane shows evidence of a pre-crash explosion. Eight of the victims found in and around the crash site must be identified by the substances found in their belongings or bodies as they can not be identified by normal methods. One victim was murdered during the flight - with the time of death established as 1 hour before the crash.

**Your Task:**

1. Use the percent composition data (below) to determine the empirical formulas for the compounds found in the victims’ luggage and bodies. *Keep two digits after the decimal as you work.*
2. Match up the empirical formulas to the compounds list (on back) to determine the identity of each compound.
3. Use the personal data provided (on back) to determine the identity of each victim.
4. Determine who crashed the plan (had the explosive), who was murdered, who was the murderer, and why.

**Percent Compositions:**

Victim # Analysis of Compound (%) Location of compound

1. C = 67.31 H = 7.00 N = 4.62 O = 21.1 pockets and luggage

2.a. C = 63.15 H = 5.26 N = zero O = 31.55 briefcase

2.b. C = 46.66 H = 4.44 N = 31.1 O = 17.76 stomach

3. C = 71.50 H = 6.98 N = 4.68 O = 16.03 pockets

4. C = 15.87 H = 2.20 N = 18.51 O = 63.41 blood and pockets

5.a. C = 75.47 H = 6.59 N = 8.38 O = 9.57 blood

5.b. C = 37.01 H = 2.20 N = 18.50 O = 42.27 luggage

6. C = 57.14 H = 6.12 N = 9.52 O = 27.20 briefcase

7.a. C = 81.60 H = 7.54 N = 9.52 O = 2.72 briefcase

7.b. C = 81.58 H = 8.84 N = 9.52 O = zero luggage

8.a. C = 60.00 H = 4.44 N = zero O = 35.53 pocket and briefcase

8.b. C = 63.36 H = 5.94 N = 9.24 O = 21.12 pocket and briefcase

**Compound Formulas:**

Formula Name Uses

C18H21NO3 Codeine prescription painkiller

C17H21NO4 Cocaine illegal narcotic

C9H8O4 Aspirin nonprescription painkiller

C14H18N2O5 Aspartame artificial sweetener

C8H8O3 Vanilla flavoring

C7H5N3O6 Trinitrotoluene explosive (TNT)

C3H5N3O9 Nitroglycerine heart medication

C40H44N4O Curare poison

C7H8N4O2 Theobromine compound found in chocolate

C21H22N2O2 Strychnine poison

C10H13N Dimetachrine prescription antidepressant

C8H9NO2 Acetaminophen nonprescription painkiller (Tylenol)

**Personal Data:**

Name Profile

Amedeo Gadro Has a heart condition

Marie Curry Often gets severe headaches

Robby Boile Baker

Freddy Wholler Drinks at least four sugar-free (diet) drinks a day

JJ Thomson Pro Athlete suspended for drug misuse several months after a minor injury

Lisa Meeter Suffers from depression

Theo Paracelsus Suspected drug dealer

Svante Arrhenius Suspected terrorist

**The Case of Mole Airlines Flight 1023 Cover Sheet**

Analysis Results (85%)

|  |  |  |  |
| --- | --- | --- | --- |
| **Victim #** | **Empirical Formula(s)** | **Name of Compound(s)** | **Name of Victim** |
| 1 |  |  |  |
| 2 | a.  b. |  |  |
| 3 |  |  |  |
| 4 |  |  |  |
| 5 | a.  b. |  |  |
| 6 |  |  |  |
| 7 | a.  b. |  |  |
| 8 | a.  b. |  |  |

Motives (15%)

Who caused the explosion that crashed the plane?

Determine who was murdered, and who is the most probable murderer, and explain (write a story about) why the murder happened.

For C

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| mass | 1 mol | = | answer | = | answer | × | factor | = | whole # |
|  | P.T. mass | lowest # |

For H

|  |  |  |  |  |  |  |  |  |  |
| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| mass | 1 mol | = | answer | = | answer | × | factor | = | whole # |
|  | P.T. mass | lowest # |

For N

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| mass | 1 mol | = | answer | = | answer | × | factor | = | whole # |
|  | P.T. mass | lowest # |

For O

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| mass | 1 mol | = | answer | = | answer | × | factor | = | whole # |
|  | P.T. mass | lowest # |

For C

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| --- | --- | --- | --- | --- | --- | --- | --- | --- | --- |
| mass | 1 mol | = | answer | = | answer | × | factor | = | whole # |
|  | P.T. mass | lowest # |

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| mass | 1 mol | = | answer | = | answer | × | factor | = | whole # |
|  | P.T. mass | lowest # |

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| mass | 1 mol | = | answer | = | answer | × | factor | = | whole # |
|  | P.T. mass | lowest # |

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| mass | 1 mol | = | answer | = | answer | × | factor | = | whole # |
|  | P.T. mass | lowest # |

For O

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| mass | 1 mol | = | answer | = | answer | × | factor | = | whole # |
|  | P.T. mass | lowest # |